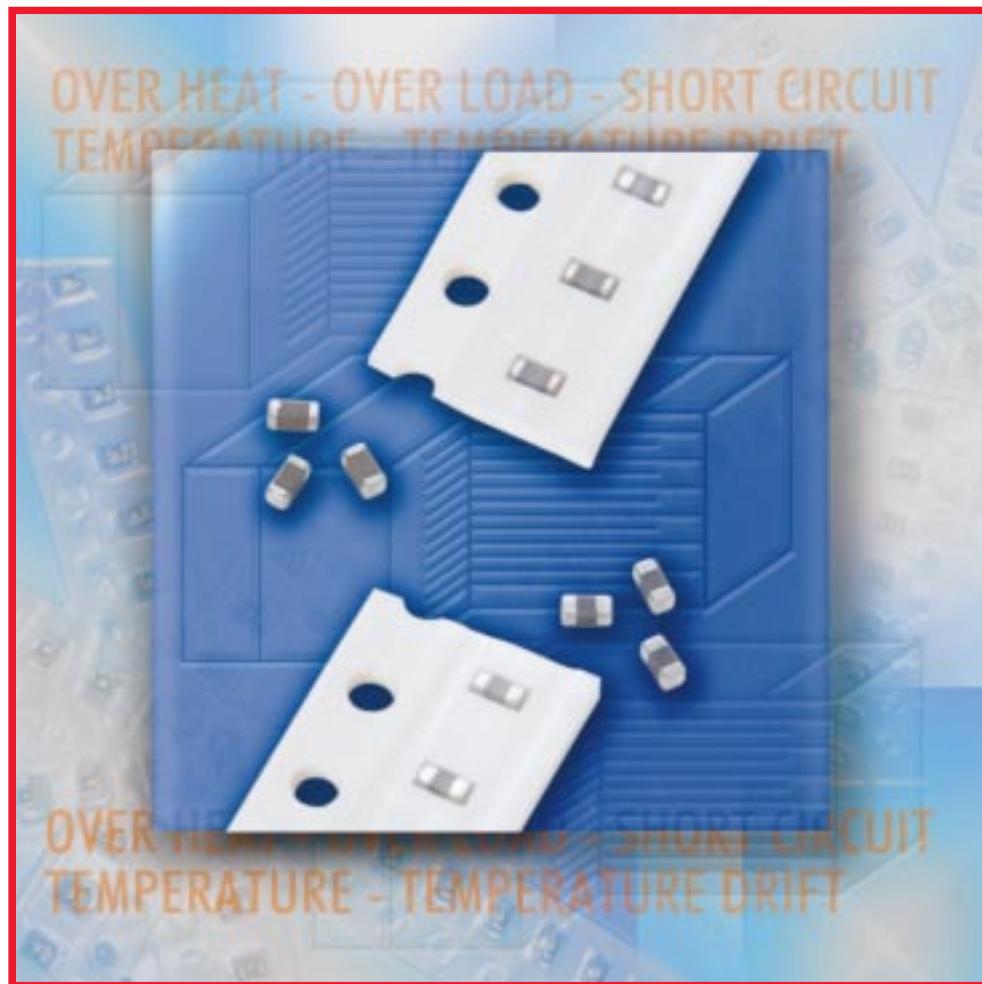
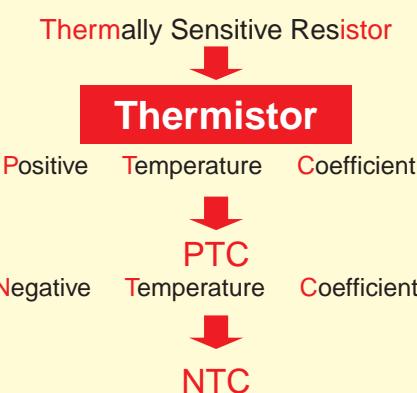


PTC - NTC
for Surface Mounting
Application



What is a Thermistor?

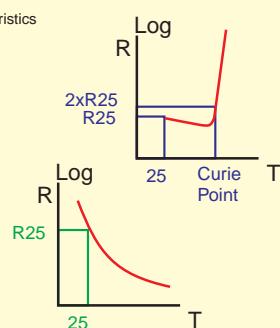


Characteristics of Thermistors

Resistance - Temperature Characteristics

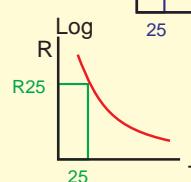
PTC Thermistor (POSISTOR®)

$\text{BaTiO}_3 + X$
 Ceramics



NTC Thermistor

Mn-Ni, Mn-Co-Cu,
 Mn-Ni + X
 Ceramics

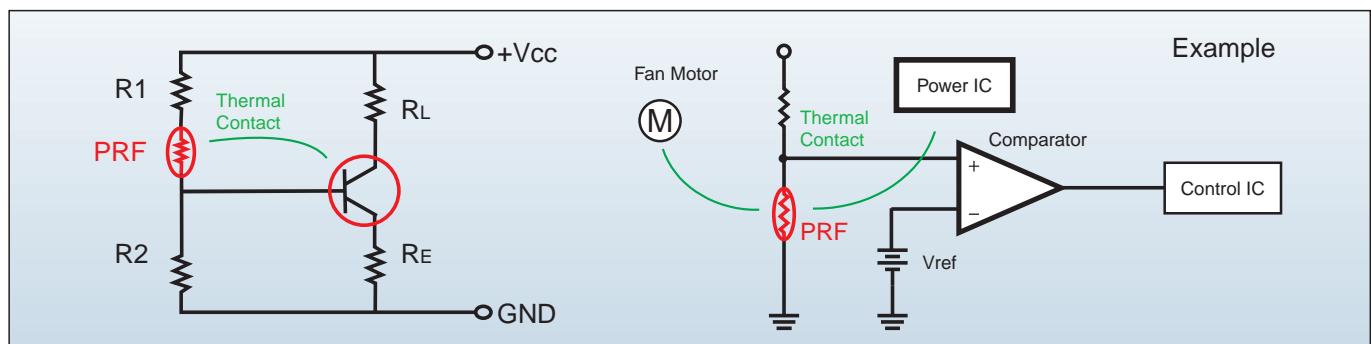


PRF15/18 Series Chip POSISTOR® for Overheat Sensing

PRF15/18 PTC Chip thermistors detect overheating of Hybrid ICs, Power Transistors, Power Diodes and Power ICs etc.

1. 0402 and 0603 light weight

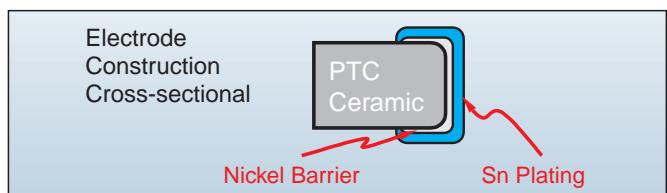
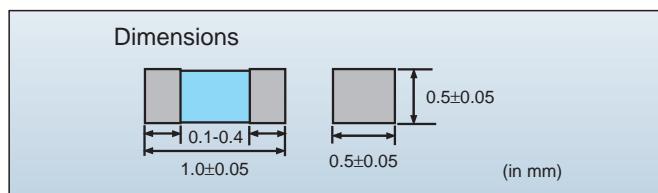
2. High gain simplifies circuit design
3. Free of contact noise and problems
4. Pb free plated terminations.
5. Sturdy construction resists mechanical vibration and shock.



PRF15 Series Characteristics



Part Number	Characteristics	Resistance (at +25°C)	Sensing Temp. (at 4.7k ohm)	Maximum Voltage	Operating Temp.
PRF15BA471QB1RC	BA	470ohm $\pm 50\%$	125 $\pm 5^\circ\text{C}$	32VDC	-20 to +140°C
PRF15BB471QB1RC	BB		115 $\pm 5^\circ\text{C}$		-20 to +130°C
PRF15BC471QB1RC	BC		105 $\pm 5^\circ\text{C}$		-20 to +120°C



PRF18 Series Characteristics

Part Number	Characteristics	Resistance (at +25°C)	Sensing Temp. * (at 4.7k ohm)	Maximum Voltage	Maximum Current	Operating Temp.
PRF18AS471QB1RB	AS	470 ohm ±50%	145±5°C	32VDC	30mA	-20 to +160°C
PRF18AR471QB1RB	AR		135±5°C			-20 to +150°C
PRF18BA471QB1RB	BA		125±5°C *			-20 to +140°C
PRF18BB471QB1RB	BB		115±5°C *			-20 to +130°C
PRF18BC471QB1RB	BC		105±5°C *			-20 to +120°C
PRF18BD471QB1RB	BD		95±5°C *			-20 to +110°C
PRF18BE471QB1RB	BE		85±5°C *			-20 to +100°C
PRF18BF471QB1RB	BF		75±5°C			-20 to + 90°C
PRF18BG471QB1RB	BG		65±5°C			-20 to + 80°C

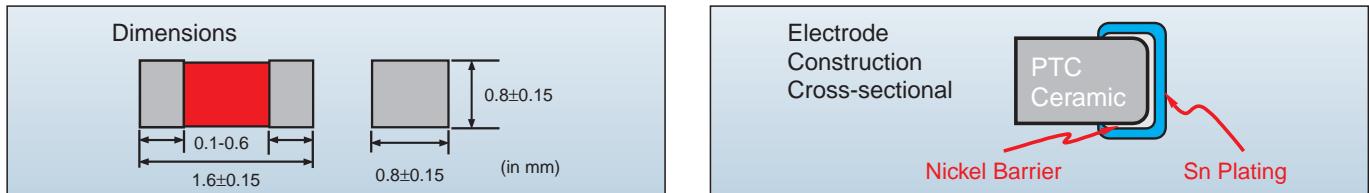
* Also available with tolerance ±3°C

Rating (0603) - Lead Free Terminations Type and UL1434 (except BF, BG types)

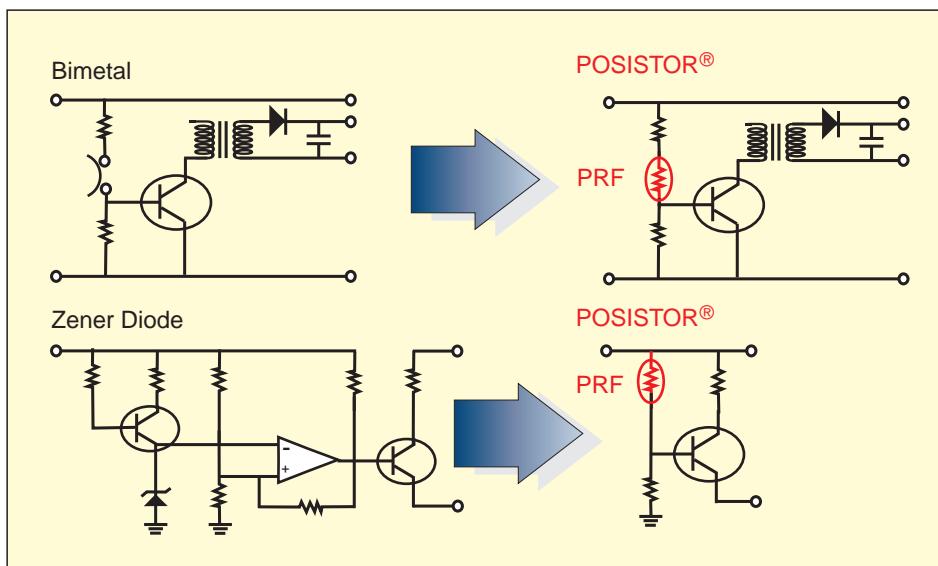


Part Number	Characteristics	Resistance (at +25°C)	Sensing Temp. (at 4.7k ohm)	Maximum Voltage	Operating Temp.
PRF18BA473QB1RB	BA	470k ohm ±50%	130±5°C	32VDC	-20 to +140°C

Low Current Consumption!



Circuit Examples



The POSISTOR® has the following advantages over Bimetal devices.

1. Noise free
2. No contact problems
3. Low price

The POSISTOR® has the following additional advantages over Zener Diodes.

1. Reduced numbers of parts used in circuits
2. Reduced process costs of mounting parts on PCBs
3. Reduces occupied space, helping high density PCB mounting

	Zener Diode		POSISTOR®	
Mounting Area	10x10 = 100mm ²		6x6 = 36mm ²	
Parts	Parts	UPS	Parts	UPS
	Diode	1	POSISTOR®	1
	Transistor	2	Transistor	1
	Resistor	7	Resistor	2
	Op. Amp.	1	Op. Amp.	0
	Total	11	Total	4

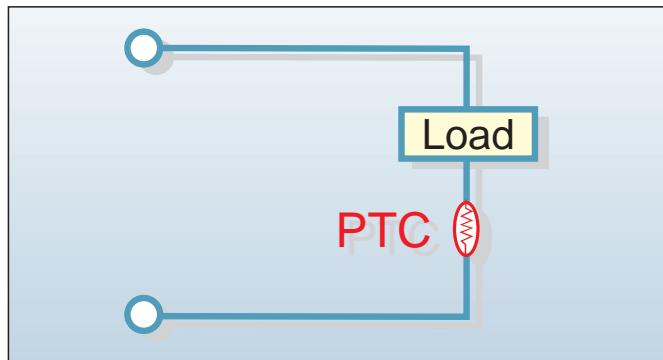
Markets & Applications of Overheat Sensing

<Set PTC Used>		<Function of PRF>		<Competitive Device>	
PRF	PC Server	Power Supply	Overheat Sensing of FET	Temperature Fuse	---
		LCD	Overheat Sensing of Power Supply	---	---
		AC Adapter	Overheat Sensing for Inverter Module of Backlight	---	---
	TV Game	DC-DC Converter	Overheat Sensing of FET	---	---
	Video Camera	AC Adapter	Overheat Sensing of FET	Temperature Fuse	---
	Lighting	AC Adapter	Overheat Sensing of PCB	---	Temperature Fuse
	Power Supply	Dimmer	Overheat Sensing of Power Tr	---	---
	Car Audio	DC-DC Converter	Overheat Sensing of FET	---	NTC Thermistor
	Audio	AMP	Overheat Sensing of Power Hybrid IC	---	---
	Air Conditioner	LCD	Overheat Sensing of Case	---	---
PRF		AMP	Overheat Sensing for Inverter of Backlight	---	---
		DC Brushless Motor	Overheat Sensing of Power Hybrid IC	---	---
	Refrigerator	DC Brushless Motor	Current Limitation & Overheat Sensing of Driver IC	---	---
	PPC/Printer	DC Brushless Motor	Overheat Sensing of Driver IC	---	---
PRF	Copy Machine	Lamp	Overheat Sensing of Driver IC	---	---
			Overheat Sensing of Lamp Starter Circuit	---	---

PRG18/21 Series Chip POSISTOR® for Overcurrent Prevention

Chip THERMISTORS prevent failure of apparatus due to excess current.

1. 0603 and 0805 light weight
2. High gain simplifies circuit design
3. Free of contact noise and problems
4. Pb free plated terminations.
5. Sturdy construction resists mechanical vibration and shock.



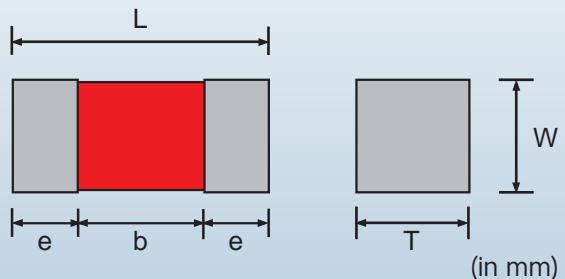
PRG Series Characteristics

Ratings - Lead Free Terminations

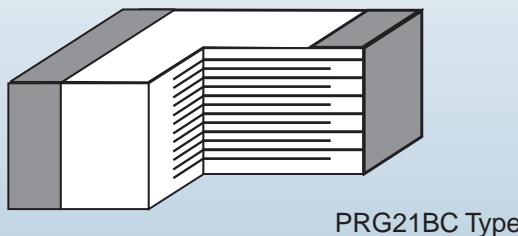
Part Number	Resistance (at +25°C)	Maximum Voltage	Maximum Current	Non-operating Current (at +60°C)	Operating Current (at -10°C)
PRG21BC0R2MM1RA	0.20 ohm ±20%	6VDC	10A	500mA	2000mA
PRG21BC4R7MM1RA	4.7 ohm ±20%	20VDC	5A	100mA	400mA
PRG21BC6R8MM1RA	6.8 ohm ±20%		3.5A	80mA	320mA
PRG21BB150MB1RK	15 ohm ±20%	20VDC	1.6A	40mA	140mA
PRG21BB220MB1RK	22 ohm ±20%		1.1A	30mA	110mA
PRG18BB330MB1RB	33 ohm ±20%	24VDC	350mA	25mA	85mA
PRG18BB470MB1RB	47 ohm ±20%		300mA	20mA	75mA
PRG18BB101MB1RB	100 ohm ±20%		200mA	15mA	55mA
PRG18BB221MB1RB	220 ohm ±20%		90mA	10mA	35mA
PRG18BB471MB1RB	470 ohm ±20%		40mA	7mA	25mA

Dimensions

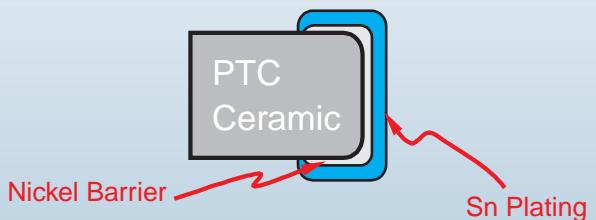
	PRG18BB	PRG21BB	PRG21BC
L	1.6±0.15	2.0±0.2	2.0±0.2
W	0.8±0.15	1.25±0.2	1.25±0.2
T		0.9±0.2	0.9±0.2
e	0.1-0.6	0.2 min.	0.2 min.
b	-	0.5 min.	0.5 min.



Multilayer Chip POSISTOR® for Overcurrent Protection



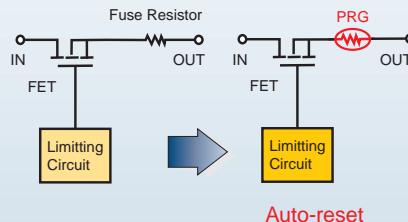
Electrode Construction Cross-sectional



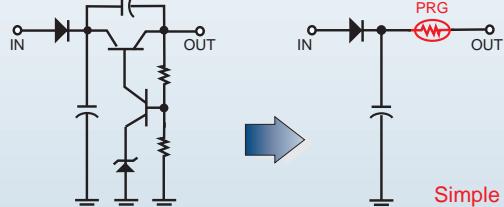
Data here are reference only. Specifications available upon request. Product to be evaluated, confirmed by the user before actual use. Description here may be revised without notice.

POSISTOR® Ideas

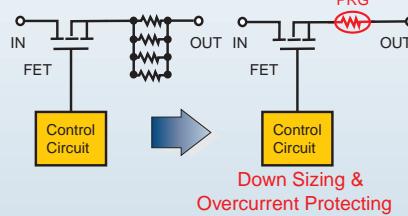
From Fuse Resistor



From Current Control Circuit



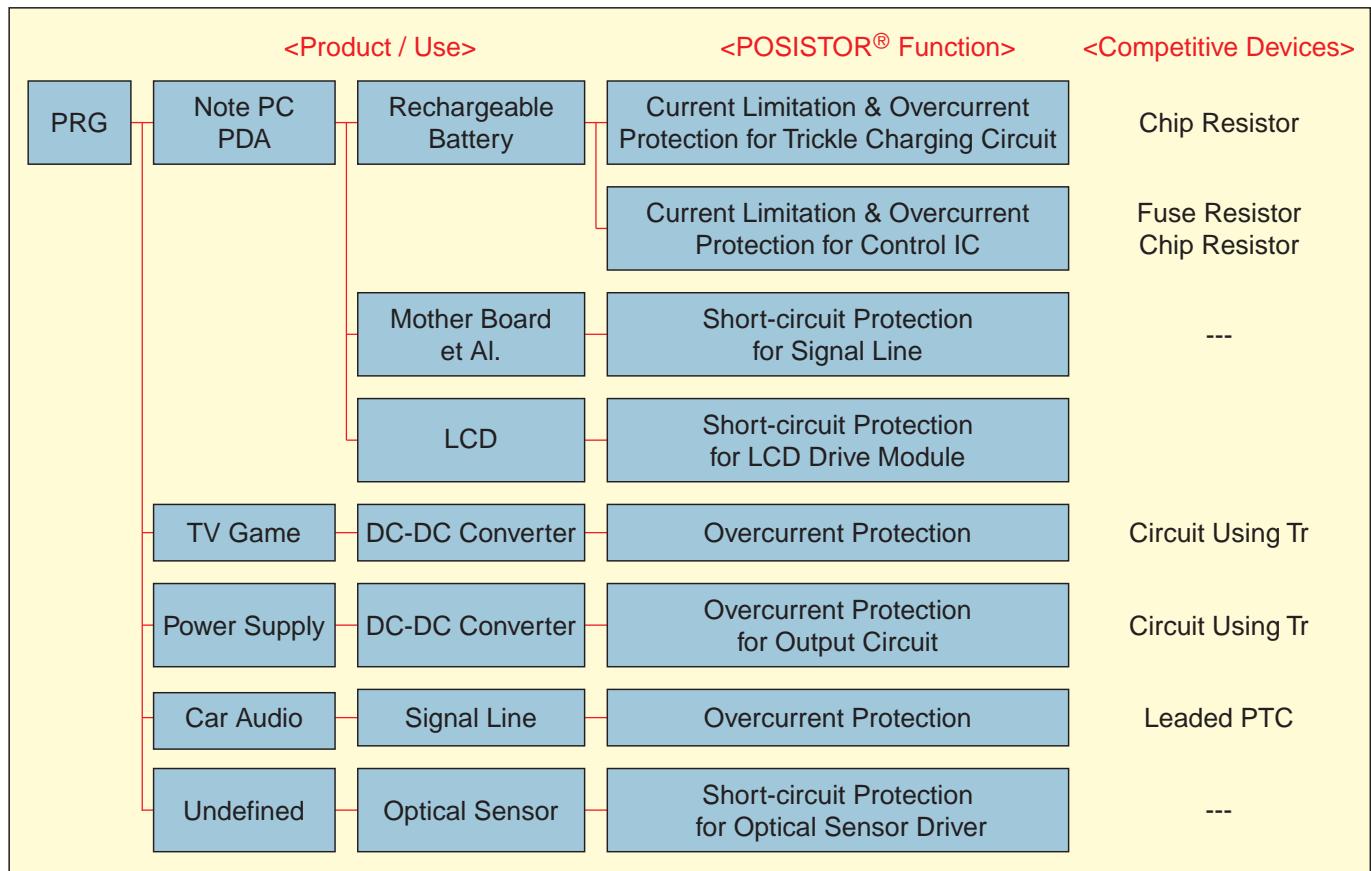
From Chip Resistor



Item	POSISTOR®	Fuse Resistor	Control Circuit	Chip Resistor
Safety	○	○	○	✗
Repeat	○	✗	○	✗
Space	○	○	✗	✗
Cost	△	△	✗	○

Key: Cross = Bad - Circle = Good - Triangle = Little difference

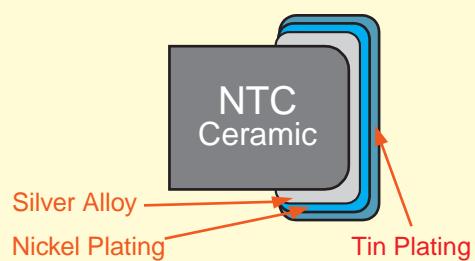
Markets & Applications for Overcurrent Protection



Chip NTC Thermistor NCP series

1. A common relationship between Resistance and B constant in all sizes (0201/ 0402/ 0603/ 0805) offers convenience when downsizing.
2. No lead contained (Pb free).
3. Tight resistance tolerance of $\pm 1\%$ (Code F) available on 10k ohm (0402, 0603), 47k ohm (0603) and 100k ohm (0603) products.
4. High soldering heat resistant
5. High humidity resistant due to unique inner electrodes.

Structure NCP Plated Terminations



Dimensions		NCP03 (0201 size)	NCP15 (0402 size)	NCP18 (0603 size)	NCP21 (0805 size)
		L 0.60±0.03	1.00±0.05	1.60±0.15	2.00±0.20
		W 0.3±0.03	0.50±0.05	0.80±0.15	1.25±0.20
		T 0.10-0.20	0.15-0.35	0.20-0.60	0.20-0.70
		e 0.85±0.15			

Line-up of Plated Termination

Resistance at 25°C	0201 NCP03				0402 NCP15			
	B-Constant	Part Number	B-Constant	Part Number	B-Constant	Part Number	B-Constant	Part Number
11 ohm	2750 K	NCP03YS110*	-	-	-	-	-	-
22 ohm	2750 K	NCP03YS220*	-	-	3100 K	NCP15XC220*	-	-
33 ohm	2750 K	NCP03YS330*	-	-	3100 K	NCP15XC330*	-	-
47 ohm	2750 K	NCP03YS470*	-	-	3100 K	NCP15XC470*	-	-
68 ohm	2750 K	NCP03YS680*	-	-	3100 K	NCP15XC680*	-	-
100 ohm	2750 K	NCP03YS101*	-	-	3250 K	NCP15XF101*	-	-
150 ohm	(3100 K	NCP03XC151*	-	-	3250 K	NCP15XF151*	-	-
220 ohm	(3100 K	NCP03XC221*	-	-	3500 K	NCP15XM221*	-	-
330 ohm	(3100 K	NCP03XC331*	-	-	3500 K	NCP15XM331*	-	-
470 ohm	(3100 K	NCP03XC471*	-	-	3650 K	NCP15XQ471*	-	-
680 ohm	(3100 K	NCP03XC681*	-	-	3650 K	NCP15XQ681*	-	-
1.0k ohm	(3500 K	NCP03XM102*	-	-	3650 K	NCP15XQ102*	-	-
1.5k ohm	(3500 K	NCP03XM152*	-	-	3950 K	NCP15XW152*	-	-
2.2k ohm	(3500 K	NCP03XM222*	-	-	3950 K	NCP15XW222*	-	-
3.3k ohm	(3500 K	NCP03XM332*	-	-	3950 K	NCP15XW332*	-	-
4.7k ohm	(3500 K	NCP03XM472*	-	-	3500 K	NCP15XM472*	-	-
6.8k ohm	3380 K	NCP03XH682*	-	-	3950 K	NCP15XW682*	-	-
10k ohm	3380 K	NCP03XH103*	-	-	3380 K	NCP15XH103*	3900 K	NCP15XV103*
15k ohm	3380 K	NCP03XH153*	-	-	3950 K	NCP15XW153*	-	-
22k ohm	3380 K	NCP03XH223*	-	-	3950 K	NCP15XW223*	4485 K	NCP15WL223*
33k ohm	4250 K	NCP03WF333*	-	-	4050 K	NCP15WB333*	4485 K	NCP15WL333*
47k ohm	4050 K	NCP03WB473*	4485 K	NCP03WL473*	4050 K	NCP15WB473*	4485 K	NCP15WL473*
68k ohm	4250 K	NCP03WF683*	4485 K	NCP03WL683*	4150 K	NCP15WD683*	4485 K	NCP15WL683*
100k ohm	4250 K	NCP03WF104*	4485 K	NCP03WL104*	4250 K	NCP15WF104*	4485 K	NCP15WL104*
150k ohm	-	-	4485 K	NCP03WL154*	4500 K	NCP15WM154*	4485 K	NCP15WL154*
220k ohm	-	-	4485 K	NCP03WL224*	4500 K	NCP15WM224*	-	-
330k ohm	(4750 K	NCP03WQ334*	-	-	-	-	-	-
470k ohm	(4750 K	NCP03WQ474*	-	-	4500 K	NCP15WM474*	-	-
680k ohm	(4750 K	NCP03WQ684*	-	-	-	-	-	-
1.0M ohm	(4750 K	NCP03WQ105*	-	-	-	-	-	-
Operating Temp.	-40 to +125°C				-40 to +125°C			
Dissipation Constant	Approx. 1.0 mW/°C				Approx. 1.0 mW/°C			
P/N in End	05RL				03RC			
Packaging	15 kpcs./reel				10 kpcs./reel			
Certified UL1434	-				Done	-		

 Recommended types

Coming soon!

* Resistance tolerance codes: F=±1%, E=±3%, J=±5%, K=±10%

10k ohm, 47k ohm, 100k ohm type have Tight Tolerance Type (±1%: NCP18XH103F03RB, NCP15XH103F03RC, NCP18WB473F10RB, NCP15WB473F03RC, NCP18WF104F12RB, NCP15WF104F03RC)

Resistance at 25°C	0603 NCP18				0805 NCP21	
	B-Constant	Part Number	B-Constant	Part Number	B-Constant	Part Number
11 ohm	-	-	-	-	-	-
22 ohm	-	-	-	-	-	-
33 ohm	-	-	-	-	-	-
47 ohm	-	-	-	-	-	-
68 ohm	-	-	-	-	-	-
100 ohm	3250 K	NCP18XF101*	-	-	-	-
150 ohm	3250 K	NCP18XF151*	-	-	-	-
220 ohm	3500 K	NCP18XM221*	-	-	3500 K	NCP21XM221*
330 ohm	3500 K	NCP18XM331*	-	-	-	-
470 ohm	3650 K	NCP18XQ471*	-	-	3650 K	NCP21XQ471*
680 ohm	3650 K	NCP18XQ681*	-	-	-	-
1.0k ohm	3650 K	NCP18XQ102*	-	-	3650 K	NCP21XQ102*
1.5k ohm	3950 K	NCP18XW152*	-	-	-	-
2.2k ohm	3950 K	NCP18XW222*	-	-	3950 K	NCP21XW222*
3.3k ohm	3950 K	NCP18XW332*	-	-	-	-
4.7k ohm	3500 K	NCP18XM472*	-	-	3500 K	NCP21XM472*
6.8k ohm	3950 K	NCP18XW682*	-	-	-	-
10k ohm	3380 K	NCP18XH103*	3900 K	NCP18XV103*	3900 K	NCP21XV103*
15k ohm	3950 K	NCP18XW153*	-	-	3950 K	NCP21XW153*
22k ohm	3950 K	NCP18XW223*	-	-	3950 K	NCP21XW223*
33k ohm	4050 K	NCP18WB333*	-	-	4050 K	NCP21WB333*
47k ohm	4050 K	NCP18WB473*	-	-	4050 K	NCP21WB473*
68k ohm	4150 K	NCP18WD683*	-	-	-	-
100k ohm	4250 K	NCP18WF104*	-	-	4250 K	NCP21WF104*
150k ohm	4500 K	NCP18WM154*	-	-	-	-
220k ohm	4500 K	NCP18WM224*	-	-	-	-
330k ohm	-	-	-	-	-	-
470k ohm	4500 K	NCP18WM474*	-	-	-	-
680k ohm	-	-	-	-	-	-
1.0M ohm	-	-	-	-	-	-
Operating Temp.	-40 to +125°C				-40 to +125°C	
Dissipation Constant	Approx. 1.0 mW/°C				Approx. 2.0 mW/°C	
P/N in End	03RB				03RA	
Packaging	4 kpcs./reel				4 kpcs./reel	
Certified UL1434	Done				Done	

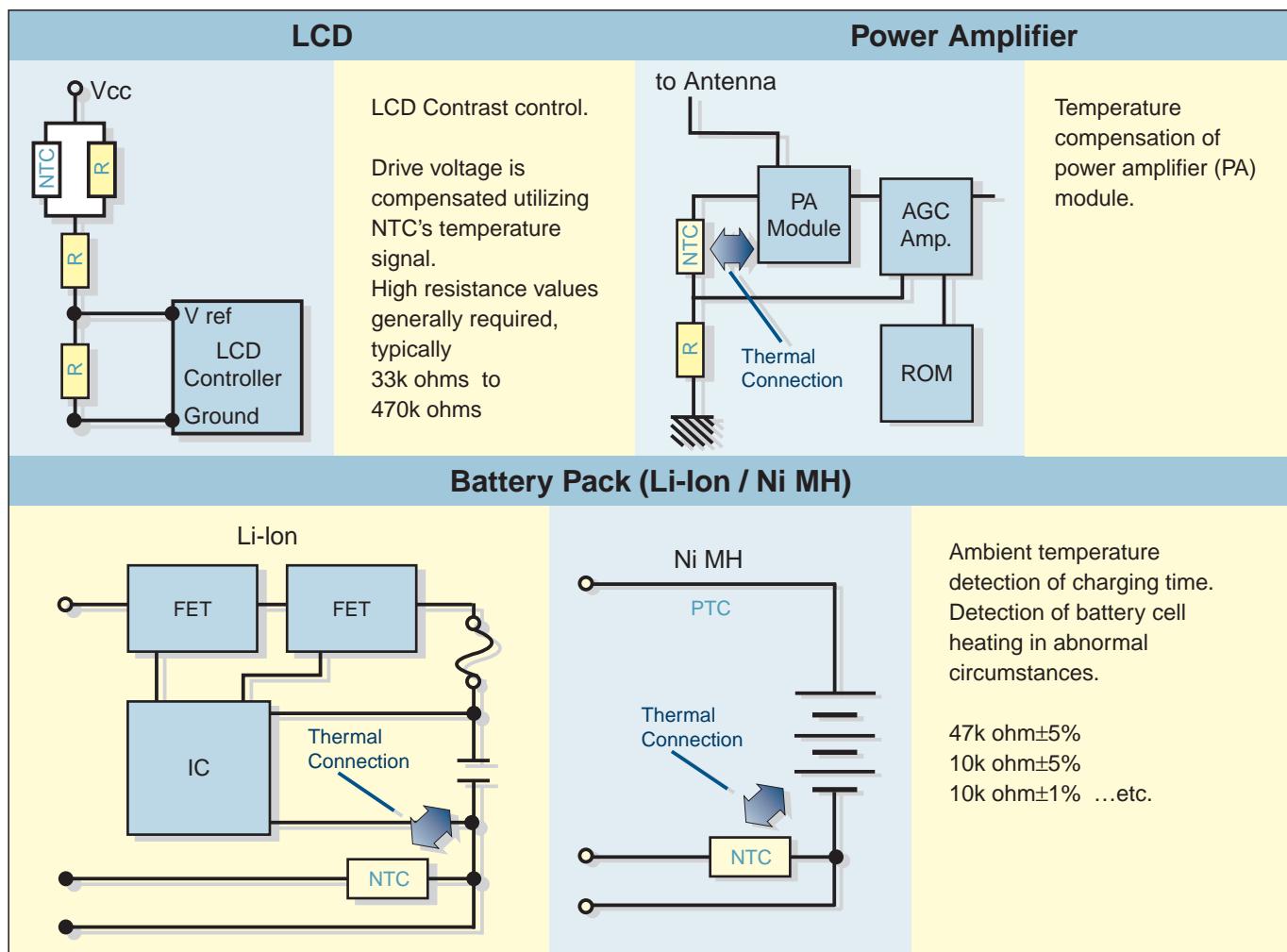
 Recommended types

Coming soon!

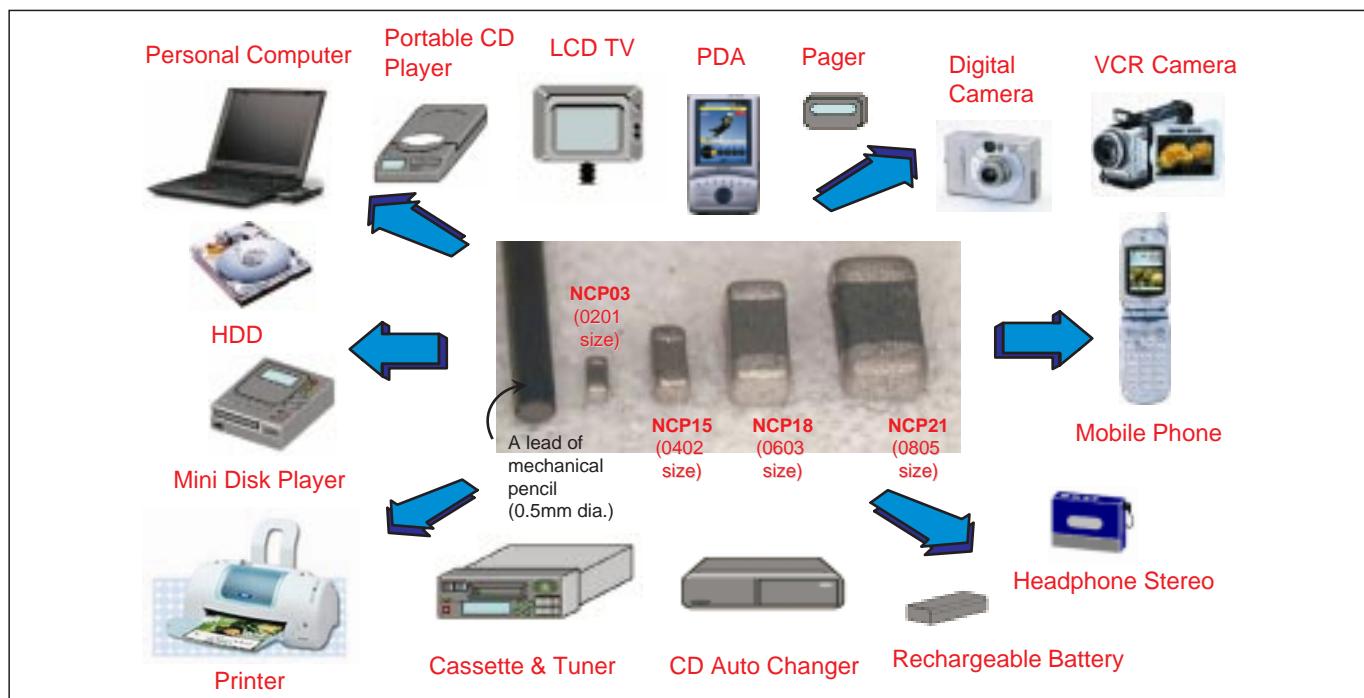
* Resistance tolerance codes: F=±1%, E=±3%, J=±5%, K=±10%

10k ohm, 47k ohm, 100k ohm type have Tight Tolerance Type (±1%: NCP18XH103F03RB, NCP18XH103F03RC, NCP18WB473F10RB, NCP18WB473F03RC, NCP18WF104F12RB, NCP18WF104F03RC)

Popular Applications of Chip NTC



More Popular Applications of Chip NTCs



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No muRata products should be used or sold, through any channels, for use in the design, development, production, utilization, maintenance or operation of, or otherwise contribution to (1) any weapons (Weapons of Mass Destruction (nuclear, chemical or biological weapons or missiles) or conventional weapons) or (2) goods or systems specially designed or intended for military end-use or utilization by military end-users.

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2. Please contact our sales representatives or product engineers before using the products in this catalog for the applications listed below, which require especially high reliability for the prevention of defects which might directly damage a third party's life, body or property, or when one of our products is intended for use in applications other than those specified in this catalog.

① Aircraft equipment	② Aerospace equipment
③ Undersea equipment	④ Power plant equipment
⑤ Medical equipment	⑥ Transportation equipment (vehicles, trains, ships, etc.)
⑦ Traffic signal equipment	⑧ Disaster prevention / crime prevention equipment
⑨ Data-processing equipment	⑩ Application of similar complexity and/or reliability requirements to the applications listed above

3. Product specifications in this catalog are as of January 2006. They are subject to change or our products in it may be discontinued without advance notice. Please check with our sales representatives or product engineers before ordering. If there are any questions, please contact our sales representatives or product engineers.

4. This catalog has only typical specifications because there is no space for detailed specifications. Therefore, please approve our product specifications or transact the approval sheet for product specifications before ordering. Especially, please read rating and ⚠CAUTION (for storage, operating, rating, soldering, mounting and handling) in them to prevent smoking and/or burning, etc.

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